

**04/02832 Energy efficiency and economic feasibility of CCHP driven by Stirling engine**

Kong, X. Q. *et al. Energy Conversion and Management*, 2004, 45, (9–10), 1433–1442.

This paper deals with the problem of energy efficiency evaluation and economic feasibility analysis of a small scale tri-generation system for combined cooling, heating and power generation (CCHP) with an available Stirling engine. Tri-generation systems have a large potential of energy saving and economical efficiency. The decisive values for energetic efficiency evaluation of such systems are the primary energy rate and comparative primary energy saving ( $\Delta q$ ), while the economic feasibility analysis of such systems relates the avoided cost, the total annual saving and payback period. The investigation calculates and compares the energy saving and economic efficiency of tri-generation system with Stirling engine against contemporary conventional independent cooling, heating and power, showing that a CCHP system saves fuel resources and has the assurance of economic benefits.

**04/02833 Evaluation of transfer capabilities of transmission systems in competitive environments**

Leite da Silva, A. M. *et al. International Journal of Electrical Power & Energy Systems*, 2004, 26, (4), 257–263.

The main objective of this work is to propose a new methodology to determine the best points in the system to add reinforcements of the transmission network and to add new agents (sellers and buyers), in order to maximize the available transfer capability (ATC), without violating a pre-established reliability level. In the process, the ATC probability density function is determined considering uncertainties from equipment unavailabilities. The proposed algorithm uses Non-sequential Monte Carlo simulation to select system state and Linear Programming with a DC Power Flow model to analyse and optimize each selected state. The IEEE reliability test system is used to illustrate the methodology.

**04/02834 Fuel prices scenario generation based on a multivariate GARCH model for risk analysis in a wholesale electricity market**

Battle, C. and Barquín, J. *International Journal of Electrical Power & Energy Systems*, 2004, 26, (4), 273–280.

This paper presents a fuel prices scenario generator in the frame of a simulation tool developed to support risk analysis in a competitive electricity environment. The tool feeds different exogenous risk factors to a wholesale electricity market model to perform a statistical analysis of the results. As the different fuel series that are studied, such as the oil or gas ones, present stochastic volatility and strong correlation among them, a multivariate Generalized Autoregressive Conditional Heteroskedastic model has been designed in order to allow the generation of future fuel prices paths. The model makes use of a decomposition method to simplify the consideration of the multi-dimensional conditional covariance. An example of its application with real data is also presented.

**04/02835 Multiproject baselines for evaluation of electric power projects**

Sathaye, J. *et al. Energy Policy*, 2004, 32, (11), 1303–1317.

Calculating greenhouse gas emissions reductions from climate change mitigation projects requires construction of a baseline that sets emissions levels that would have occurred without the project. This paper describes a standardized multi-project methodology for setting baselines, represented by the emissions rate (kg C/kWh), for electric power projects. A standardized methodology would reduce the transaction costs of projects. The most challenging aspect of setting multi-project emissions rates is determining the vintage and types of plants to include in the baseline and the stringency of the emissions rates to be considered, in order to balance the desire to encourage no- or low-carbon projects while maintaining environmental integrity. The criteria for selecting power plants to include in the baseline depend on characteristics of both the project and the electricity grid it serves. Two case studies illustrate the application of these concepts to the electric power grids in eastern India and South Africa. The authors use hypothetical, but realistic, climate change projects in each country to illustrate the use of the multiproject methodology, and note the further research required to fully understand the implications of the various choices in constructing and using these baselines.

**04/02836 Optimization of a fuel cell system using process integration techniques**

Godat, J. and Marechal, F. *Journal of Power Sources*, 2003, 118, (1–2), 411–423.

A model of a system including a proton exchange membrane (PEM) fuel cell and its fuel processing section has been developed. The goal was to investigate the process configurations to identify the optimal operating conditions and the optimal process structure of the system by applying modelling and process integration techniques. A simulation model using commercial chemical process simulation software [Belsim-

VALI III, Version 10: User Guide, Belsim s.a., Rue Georges Berotte 29A, B-4470 Saint-Georges-sur-Meuse, Belgium (2001)] has been developed. The model includes a steam methane reforming (SMR), a water gas shift (WGS) and a preferential oxidation (PROX) for the fuel processing feeding a proton exchange membrane cell stack (PEM) and a post-combustion unit. The energy and the material flows obtained by simulation have been used to compute the process composite curves of the system. This has been used to identify the best heat exchange opportunities and to define the optimal operating conditions of the reforming system in order to provide the best overall efficiency considering the balance of plant. By improving the energy integration of the system and by using optimization of operating conditions, the efficiency can be raised from 35% for the reference system to up 49% in the optimized design. This is obtained both by process configuration modifications and by optimizing operating set-points. The model developed has been used for sensitivity analysis and will serve as a basis for further process design including the optimal structure determination and the thermo-economic optimization.

**04/02837 Preventive analysis and solution of overloads in the Spanish electricity market**

Lobato, E. *et al. Electric Power Systems Research*, 2004, 68, (3), 185–192.

The technical feasibility of a power generation dispatch in competitive electricity markets consists of not having any overloaded equipment, not only in case of normal operating condition, but also when any contingency established in the security criteria occurs. In addition, bus voltages should be within their limits. This paper describes an optimization method to analyse and solve the transmission overloads that arise in each hourly scenario of the Spanish power system, after the electricity market has been cleared. Overloads are solved in the Spanish market by increasing and decreasing generation of connected units, and by connecting off-line ones. The proposed method comprises three steps: (a) contingency analysis, (b) preventive active dispatch and (c) classification of generation re-dispatch. The performance of the method is illustrated using an actual example of the Spanish electricity market.

**04/02838 Regulatory performance analysis case study: Britain's electricity industry**

de Oliveira, R. G. and Tolmasquim, M. T. *Energy Policy*, 2004, 32, (11), 1261–1276.

The success or failure of the privatization and liberalization of electricity supply industries has more often been judged in terms of process than of outcomes. In this paper, in contrast, this performance is assessed in terms of the performance of its associated system of regulatory governance. Taking the UK's electricity supply industry between 1989 and 2000 as case study, initially, a vertical cross-section of the regulation system gives a finding matrix for the various stakeholders involved and identifying winners and losers from the standpoint of funding flows. Next, a horizontal cross-section provides the environmental, distributive, allocative, dynamic and productive efficiencies grid for this system. The survey shows that the performance of the British ESI regulation system produced benefits, although not for all stakeholders and not as fairly as possible. The chosen path did not seem sustainable and failed to respect intergenerational transfers as a way of fostering sustainability and equity. It was unable to underpin simultaneous improvements in efficiencies over time, while redistributing industry's funding flows among the players in a regressive manner.

**04/02839 Reorganization of the power distribution sector in India**

Dossani, R. *Energy Policy*, 2004, 32, (11), 1277–1289.

This paper presents the central issues for electricity-sector reform in India, as they grew out of the reform process that began in 1991, and within the context of the sector's organization, regulatory structure, and other institutional characteristics. The paper argues that India's current reform policies will not be sufficient to achieve reliable, efficient power because distribution reform has not been done. Undertaking distribution reform is a difficult path to tread because of the absence of global consensus on best practices and conflicting forces, both economic and political. The paper analyses alternative institutional structures for reform in the distribution sector. The findings include that the objectives of coverage and efficiency may conflict, that economically efficient reorganization may be politically unachievable and that the small, municipally owned firm may be the best compromise. Since many Indian states are economically and politically diverse from each other, and include both large served and unserved areas, there is scope to vary the organizational structure depending on the state's situation. This paper provides a means to do so. The agenda for policymakers is to identify the situation in their respective states and choose a reorganization path that is the best compromise.